

WHAT IS CLAIMED IS:

1. A method for making a mesoporous or combined mesoporous/microporous inorganic oxide comprising the steps of:

5 a) reacting a source of inorganic oxide with a complexing agent at a complexation temperature to provide at least one complex;

b) decomposing the at least one complex to provide a porous material precursor having an inorganic oxide framework containing at least some organic pore-forming agent; and

10 c) removing at least a major portion of the organic pore-forming agent from the inorganic oxide framework by solvent extraction and/or calcination.

2. The method of claim 1 wherein the source of inorganic oxide comprises at least one inorganic oxide of at least one element of one of Groups IVB, VB, VIB, VIIB, III, IB, IIB, IIIB, VIII, VA, IIIA, IVA, IIA and lanthanide of the Periodic Table of the Elements.

15 3. The method of claim 2 wherein the inorganic oxide comprises at least one oxide of at least one element selected from the group consisting of Si, Al, Ti, V, Cr, Zn, Fe, Sn, Mo, Ga, Ni, Co, Zr, Cu, Mg, Bi, Nb, Mn, Zr, Sb, La, Ce, Te and W.

20 4. The method of claim 1 wherein the source of inorganic oxide comprises an organic compound selected from the group consisting of tetraethylorthosilicate and aluminum isopropoxide, silatrane, alumatrane and titanatrane.

5. The method of claim 1 wherein the source of inorganic oxide is selected from hydrated or unhydrated oxides, hydroxides, nitrates, carbonates, or ammonium salts of at least one metal selected from the group consisting of Si, Al, Ti, V, Cr, Zn, Fe, Sn, Mo, Ga, Ni, Co, Zr, Cu, Mg, Bi, Nb, Mn, Zr, Sb, La, Te, Ce and W.

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6. The method of claim 1 wherein the source of inorganic oxide is silica source, selected from the group consisting of silica gel, silica hydrogel, silica aerogel, and fumed silica.

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7. The method of claim 1 wherein the source of inorganic oxide is aluminum hydroxide or alumina.

8. The method of claim 1 wherein the source of inorganic oxide is selected from the group consisting of magnesium oxide and magnesium hydroxide.

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9. The method of claim 1 wherein the complexing agent is an organic compound having amino groups.

10. The method of claim 9 wherein the complexing agent is an alkanolamine.

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11. The method of claim 10 wherein the alkanolamine is selected from the group consisting of triethanolamine, tri-isopropanolamine, tripropanolamine, tris-hydroxymethyleneaminomethane, N,N-dimethylethanolamine and combinations thereof.

5 12. The method of claim 1 wherein the complexing agent is combined with a glycol solvent.

13. The method of claim 12 wherein the glycol solvent is selected from the group consisting of ethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, 10 tripropylene glycol and tetrapropylene glycol.

14. The method of claim 1 wherein the complexation temperature ranges from about 150°C to about 250°C.

15 15. The method of claim 1 wherein the step (b) of decomposing the complex comprises hydrolysis of the complex with an acidic, basic or neutral pH aqueous fluid.

16. The method of claim 1 wherein the step (b) of decomposing the complex comprises calcining the complex at a temperature of from about 251°C to about 400°C.

17. The method of claim 1 wherein the solvent extraction comprises immersing the porous material precursor in a solvent selected from the group consisting of water, alcohols, ethers, ketones, esters and combinations thereof.

5           18. The method of claim 1 wherein the calcination of step (c) comprises heating the porous material precursor to a temperature of from about 401°C to about 1100°C for a period of time ranging up to about 48 hours.

10           19. The method of claim 1 further comprising the step of aging the porous material precursor at a temperature of from about 20°C to about 120°C for a period of time ranging up to about 48 hours.

            20. The method of claim 1 further comprising the step of drying the porous material precursor after ageing the porous material precursor.

15           21. The method of claim 1 further comprising the step of heating the porous material precursor under elevated pressure for a period of time of up to about 4 days.

20           22. The method of claim 1 further comprising the step of adding a zeolite to the complex of step (a).

23. The method of claim 22 wherein said zeolite is selected from the group consisting of zeolite Y, zeolite X, zeolite L, zeolite A, zeolite beta, mordenite, SSZ-32, ZSM-5, ZSM-11, ZSM-22, ZSM-23, ZSM-48, ZSM-58, MCM-22, MCM-36, PSH-3, silicalite-1 and silicalite-2.

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24. The method of claim 1 further comprising the step of recovering the organic pore forming agent from the porous material precursor.